

A new arboreal species of *Vitronura* Yosii, 1969 and a new record of *Yuukianura* Yosii, 1955 (Collembola, Neanuridae) from China, with notes on the feeding behavior of Neanurinae

Ji-Gang Jiang¹, Daoyuan Yu²

¹ College of Life and Environmental Science, Hunan University of Arts and Science, Changde 415000, Hunan, China

² Soil Ecology Lab, College of Resources and Environmental Sciences, Nanjing Agricultural University, Nanjing 210095, China

Corresponding author: Daoyuan Yu (yudy@njau.edu.cn)

Abstract

A new species, *Vitronura cheni* **sp. nov.** (Collembola: Neanuridae) is described from Yongzhou, Hunan Province, China. The new species is characterized by the combination of following characters: 2+2 uncolored big eyes; labral chaetotaxy as 0/2, 2; cephalic tubercle Fr with chaeta O; cephalic tubercles DI, L and So fused; mandibles with four teeth; maxillae with two lamellae, the long one with a tiny tooth and the short one with pointed tip; labrum truncated; claw without inner tooth; and femur and tibiotarsus with a tenant chaeta. *Yuukianura szeptyckii* Deharveng & Weiner, 1984 was reported from China for the first time. Observations of a cultured population of *Y. szeptyckii* revealed feeding preferences and behavior that differ from those previously reported in other members of Neanurinae. A checklist of *Yuukianura* species and distributions is also provided.

Key words: Checklist, feeding preference, Lobellini, new species, springtails, *Vitronura cheni* sp. nov., *Yuukianura szeptyckii*



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Introduction

Vitronura was established by Yosii (1969) as a subgenus under *Neanura* MacGillivray, 1893, and was raised to generic level by Cassagnau (1983). This genus is mainly characterized by the presence of separate tubercles Fr and An on the dorsal side of the head (Smolis and Deharveng 2006). Till now, 25 valid species of *Vitronura* have been reported worldwide (Bellinger et al. 1996–2025; Jiang et al. 2025). In 2024, during an entomological survey in Mountain Jiuyi National Nature Preserve, Hunan, China, a tree-dwelling new species of *Vitronura* was discovered and described herein.

Yuukianura Yosii, 1955 was initially established for the species *Protanura aphoroides* Yosii, 1953, characterized by its slender body shape, weakly-developed tubercles, and modified mouthparts. To date, a total of 11 species of *Yuukianura* have been reported from humid habitats across Asia, the Pacific Islands, Australia, and Great Britain (Deharveng et al. 2017; Smolis 2017; Kasai et al. 2024). In this paper, a species originally described from the Korean Peninsula, i.e., *Yuukianura szeptyckii* Deharveng & Weiner, 1984,

is recorded for the first time from Nanjing, China. In addition, we provide a report on the feeding preferences and behavior of this species based on observations of a cultured population.

Material and methods

Specimens were collected by sieving and preserved in alcohol. They were mounted on slides using Hoyer’s solution and then dried for two weeks in an oven at 50 °C. Illustrations were made using a Nikon DS-Ri2 camera mounted on a Nikon 80i phase-contrast microscope and prepared for publication with Adobe Photoshop CS2. The terminology and layout of the tables used in this paper follow Deharveng (1983), Deharveng and Weiner (1984), Smolis and Deharveng (2006), and Smolis (2008).

Additionally, *Yuukianura szeptyckii* was cultured in the laboratory to observe its feeding behavior. To establish the microcosms, plastic containers with a height of 10 cm and a base area of 10×20 cm were used, filled with a 2 cm-thick layer of moistened peat soil as the substrate. A ventilation opening was created in the lid and covered with gauze. The containers were placed in a climate-controlled chamber with a constant temperature of 20±0.5 °C and 75%±5% humidity. Day and night cycles were set to 12 hours each, with day-time light intensity ranging from 300 to 800 lux. The feeding preference of the new species was tested with three types of food resources: fungi (Brewer’s yeast, *Saccharomyces cerevisiae*), plant seeds (oat flakes, *Avena sativa*), and slime mold (*Physarum polycephalum*).

Abbreviations

General morphology:

| | |
|-------------|--------------|
| Abd. | abdomen |
| Ant. | antenna |
| Cx | coxa |
| Fe | femur |
| Scx2 | subcoxa 2 |
| Ti | tibiotarsus |
| Th. | thorax |
| Tr | trochanter |
| VT | ventral tube |

Groups of chaetae:

| | |
|------------|-------------------------|
| Ag | antegenital |
| An | anal |
| Fu | furcal |
| Vc | ventrocentral |
| Ve | ventroexternal |
| Vi | ventrointernal |
| VI | ventrolateral |
| Vei | ventroexternointernales |

| | |
|------------|------------------------|
| Vec | ventroexternocentrales |
| Vel | ventroexternolaterales |
| Vea | ventroexternoanterior |
| Vem | ventroexternomedial |
| Vep | ventroexternoposterior |

Tubercles:

| | |
|-----------|---------------|
| An | antennal |
| Fr | frontal |
| Cl | clypeal |
| De | dorsoexternal |
| Di | dorsointernal |
| DI | dorsolateral |
| L | lateral |
| Oc | ocular |
| So | subocular |

Types of chaetae:

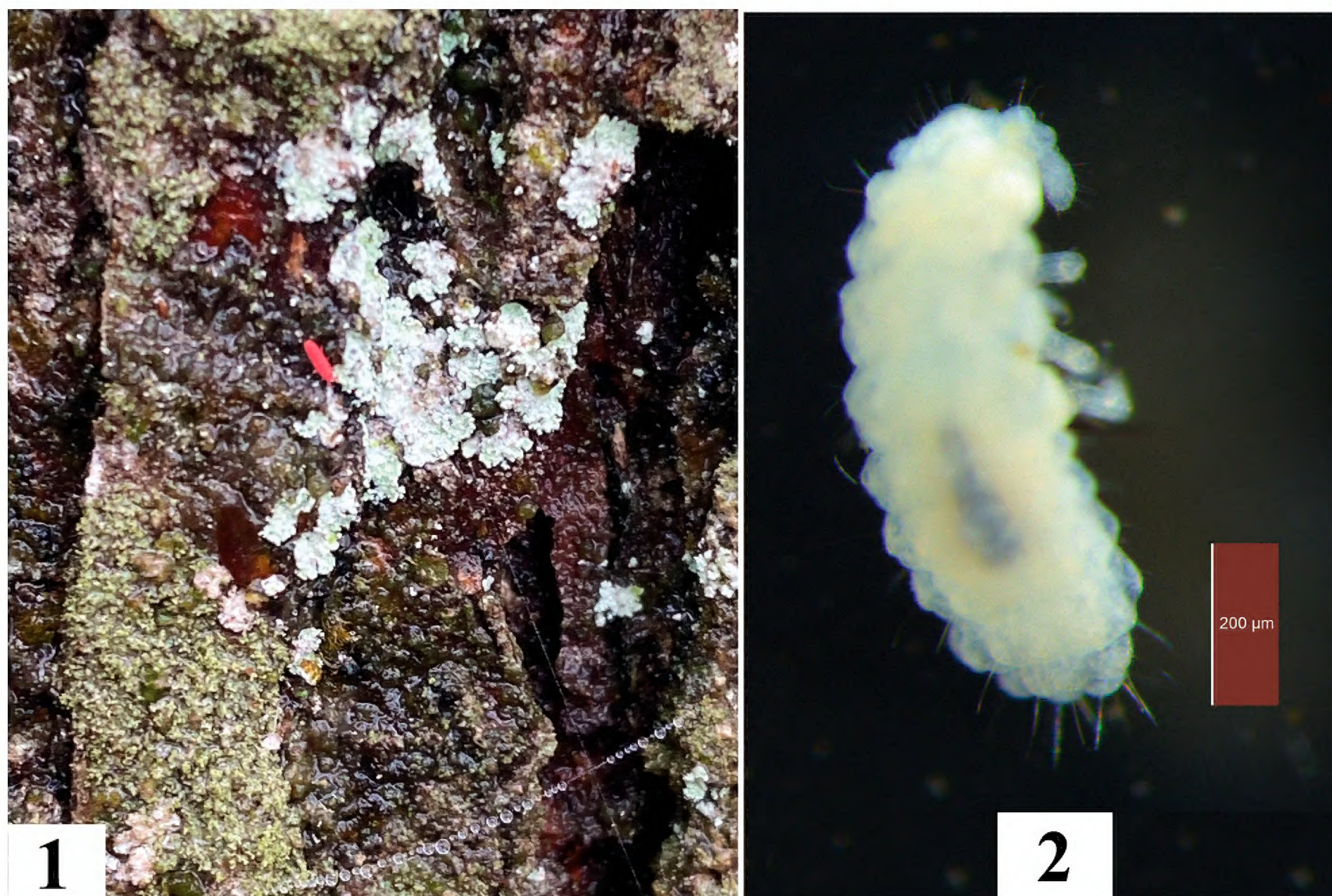
| | |
|---------------|---|
| MI | long macrochaeta |
| Mc | short macrochaeta |
| Mcc | very short macrochaeta |
| me | mesochaeta |
| ms | s-microchaeta |
| S or s | chaeta s |
| Or | organite of ant. IV |
| i | ordinary micro- or mesochaeta on ant. IV |
| mou | cylindrical sensilla on ant. IV (“soies mousses” in Deharveng 1981) |
| x | labial papilla x |
| L’ | ordinary chaeta on abd. V |

Results

Family Neanuridae Börner, 1901 sensu Yosii 1956
Subfamily Neanurinae Börner, 1901
Tribe Lobellini Cassagnau, 1983
Genus *Vitronura* Yosii, 1969

Vitronura cheni sp. nov.
<https://zoobank.org/ACD8D18C-AEE9-4869-940E-B88218FB07DE>
Figures 1–14, Tables 1, 2

Type material. Holotype: • Male, Mountain Jiuyi National Nature Preserve, Ningyuan County, Yongzhou, Hunan Province, CHINA, coordinates: 25.2538°N, 112.0188°E, alt. 1445 m, on trunk of pine trees, leg. Ji-Gang Jiang, 2.v.2024 (No. 2024050102). **Paratypes:** • three females and one male, same data as the holotype. Type materials are deposited at the Key Laboratory of Zoology, Hunan University of Arts and Science (HUAS), Changde, Hunan Province, China.



Figures 1, 2. *Vitronura cheni* sp. nov.: 1. Live specimen on pine tree; 2. Preserved specimen in alcohol.

Etymology. The name of the species is dedicated to Professor Jian-Xiu Chen, Nanjing University, China, for his outstanding contributions to Chinese Collembola.

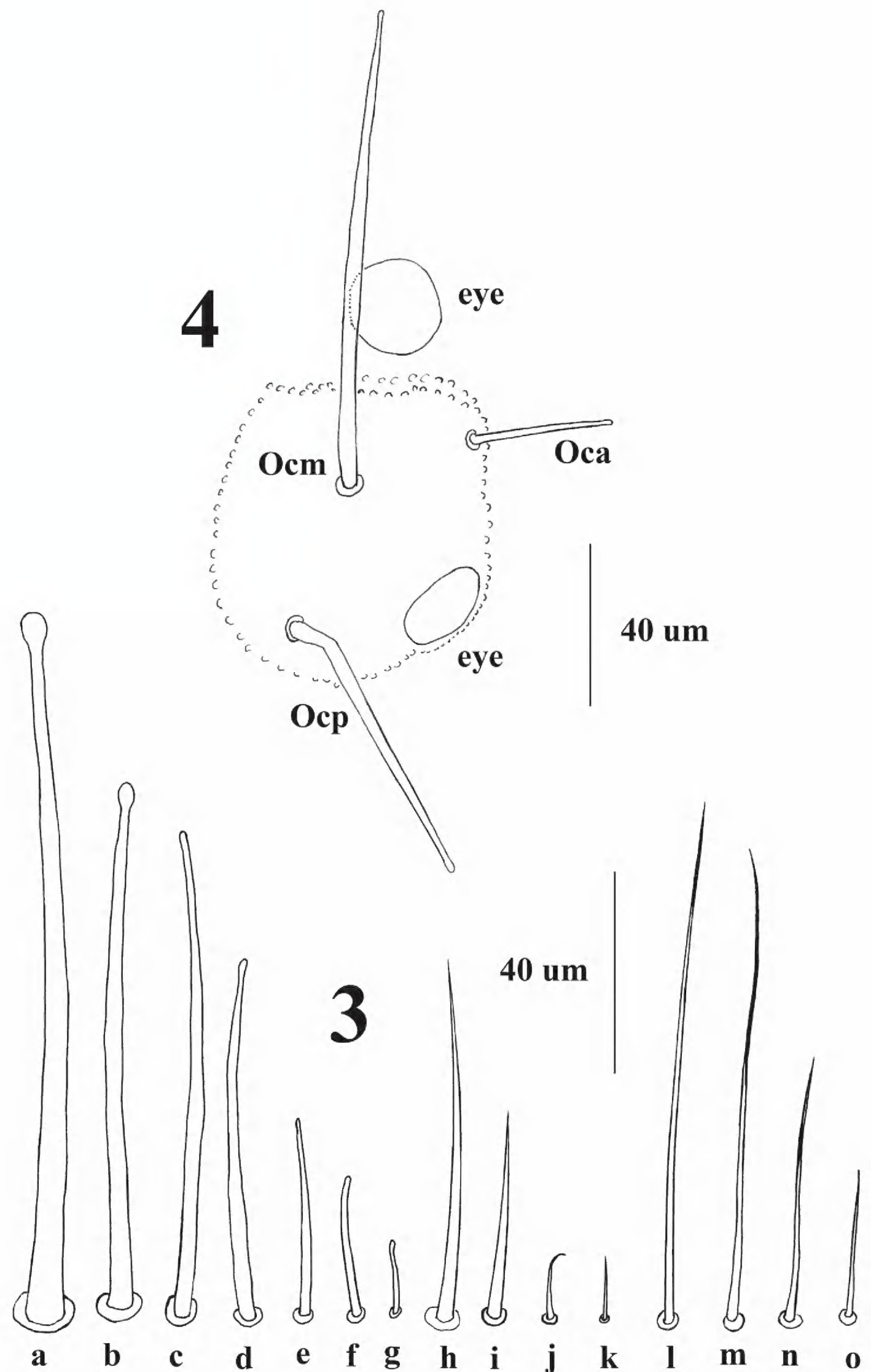
Diagnosis. Two eyes per side on head, colorless; cephalic chaeta 0 present; body tubercles well differentiated; cephalic tubercles DI, L and So fused; mandible with a basal tooth, a middle tooth and two apical teeth; maxilla with two lamellae, the longer one with one tiny tooth, and the shorter one needle-like; body dorsum macrochaetae usually slightly clavate; labrum truncated; claw without inner tooth; femur and tibiotarsus with a tenent chaeta.

Description. Body length: 1.4–1.7 mm. Color: living specimens red (Fig. 1) and whitish in alcohol (Fig. 2).

Chaetal morphology. Dorsal ordinary chaetae of four types. Long macrochaetae (MI) smooth, clavate (Fig. 3a). Short macrochaetae (Mc) shorter than MI, clavate or with blunt tip and with variety of lengths (Fig. 3b, c, d). Very short macrochaetae (Mcc) morphologically similar to but shorter than Mc, with variety of lengths (Fig. 3e, f, g). Mesochaetae (me) smooth, pointed and with variable lengths (Fig. 3h, i, j, k). S-chaetae (s) on terga thin, smooth, usually shorter than Mc and equal to that of medium me, chaetae s on abd. V (Fig. 3n) longer than that of Abd. I–III (Fig. 3o). Tenent chaeta on tibiotarsus morphologically similar to but much longer than chaeta s, subequal to the longest Mc (Fig. 3l, m).

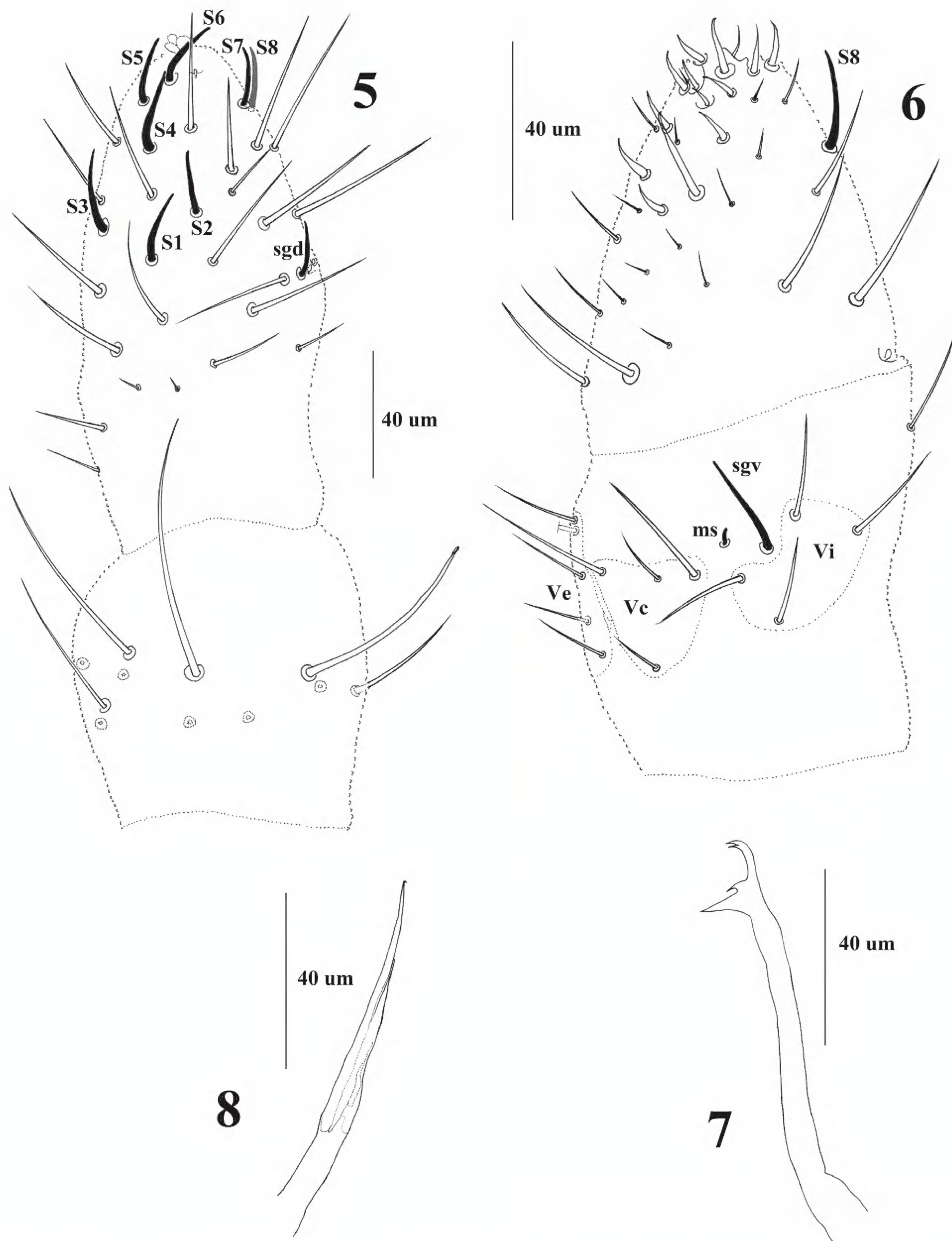
Head. Each side with 2 uncolored big eyes, one anterior, but not included in Oc tubercle, the other one on the posterior part of Oc tubercle (Fig. 4).

Antenna four-segmented. Ant. I with 7 chaetae. Ant. II with 11 chaetae. Ant. III dorsally fused to Ant. IV. Guard chaeta sgd of Ant. III not migrated distally,



Figures 3, 4. *Vitronura cheni* sp. nov.: **3.** Chaetal types: Ml (**a**), Mc (**b–d**), Mcc (**e–g**), me (**h–k**), tenent chaeta (**l–m**), s (**n**: chaeta s on Abd. V, **o**: chaeta s on Abd.I); **4.** Tubercle Oc (right side).

at the same level as the two sensory rods. Ant. IV dorsally with eight subequal, slightly thickened and blunt sensilla (S1–8), apically with three bulbs, subapical organite (or) present (Fig. 5). Ventral side of Ant. IV with about 14 pointed thickened chaetae (Fig. 6). On ventral side of Ant. III, Vi, Vc and Ve with 4, 4, 5 chaetae respectively (Fig. 6).



Figures 5–8. *Vitronura cheni* sp. nov.: **5.** Ant. II–IV (dorsal side); **6.** Ant. III–IV (ventral side); **7.** Mandible; **8.** Maxilla.

Mandible consisting of one basal tooth, one middle tooth and two apical teeth (Fig. 7). Maxilla consisting of two lamellae, the long lamella apically with a tiny tooth, and the short one with pointed tip (Fig. 8). Labrum truncated, labral formula as 0/2, 2. Labium with 11 chaetae and two papillae x.

Cephalic dorsal tubercles and chaetotaxy as in Table 1 and Fig. 9. Central area of head with six tubercles: one Cl, one Fr, two Oc and two An independent respectively; chaeta O present on tubercle Fr as a Mc. Dorso-posterior area with four separate tubercles: two Di and two De, chaeta Di2 and De2 as mes on tubercle De. Tubercles Dl, L and So on dorsal lateral area fused, with 11–12 chaetae.

Table 1. Cephalic tubercles and chaetotaxy of *V. cheni* sp. nov.

| Tubercle or group of chaetae | Number and type of chaetae | Chaetae names |
|------------------------------|----------------------------|---------------|
| Cl | 2 Mc | F |
| | 2 Mc | G |
| An | 1 MI | B |
| Fr | 3 Mc | C, D, E |
| | 3 Mc | 2A, O |
| Oc | 1 MI | Ocm |
| | 1 Mc | Ocp |
| | 1 mcc | Oca |
| Di | 1 Mc | Di1 |
| De | 1 MI | De1 |
| | 2 Mcc | Di2, De2 |
| Dl+L+So | 4 MI+7–8 Mc (or me) | Uncertain |

Ventral chaetotaxy of head. Group Vi with six chaetae, groups Vea with four, Vem with three and Vep with three chaetae, respectively.

Thorax (Fig. 10 and Table 2). Th. I with 3+3 tubercles, Di with 1, De with 2, Dl with 1 chaeta. Th. II with 4+4 tubercles. Di with three chaetae. De with five (4+s) or four (3+s) chaetae. Dl with five (3+s+ms) chaetae. Tubercle L with three chaetae. Th. III with 4+4 tubercles, Di with three chaetae, De with five (4+s) chaetae, Dl with four (3+s) chaetae, and L with three chaetae. Chaetotaxy of thorax and legs listed in Table 2. Unguis without inner or lateral teeth; unguiculus absent. Each Femur and tibiotarsus respectively with a tenent chaeta on all legs (Figures 3l, m, 11, 12).

Table 2. Postcephalic dorsal tubercles and chaetotaxy of *V. cheni* sp. nov.

| Terga | | | | | Legs | | | | |
|----------|-------------------|---------------|-----------------|-------------|-------------------------------|----|----|----|----|
| | Di | De | DI | L | Scx2 | Cx | Tr | Fe | T |
| Th. I | Mc | Mc+Mcc | MI | – | 0 | 3 | 6 | 11 | 19 |
| Th. II | MI+Mc+Mcc (or me | MI+3Mc+ +s | MI+Mc+ Mcc+s+ms | MI+2Mcc | 2 | 7 | 6 | 8 | 19 |
| Th. III | MI+Mc+ Mcc (or me | MI+3Mc+ +s | MI+Mc+ Mcc +s | MI+2Mcc | 2 | 8 | 6 | 8 | 18 |
| Terga | | | | | Sterna | | | | |
| Abd. I | MI+Mc | MI+ 2Mcc+s | MI+Mcc | MI+2Mcc | VT: 4 | | | | |
| Abd. II | MI+ Mc | MI+ 2Mcc+s | MI+Mcc | MI+2Mcc | Vi: 1, Ve: 4, Ve1: 0 | | | | |
| Abd. III | MI+ Mc | MI+ 2Mcc+s | MI+Mcc | MI+2Mcc | Fu: 4, Ve: 4 | | | | |
| Abd. IV | MI+ Mcc | MI+Mcc+s | MI+Mc +Mcc | MI+2Mc +3me | Vei: 2, Vec: 3, Vel: 4, VI: 5 | | | | |
| Abd. V | MI+2Mcc | s+2MI+Mc+Mcc | | 4me | Ag: 3, VI: 0 | | | | |
| Abd. VI | 4MI+3me | | | | Ve: 13, An: 3 mi | | | | |

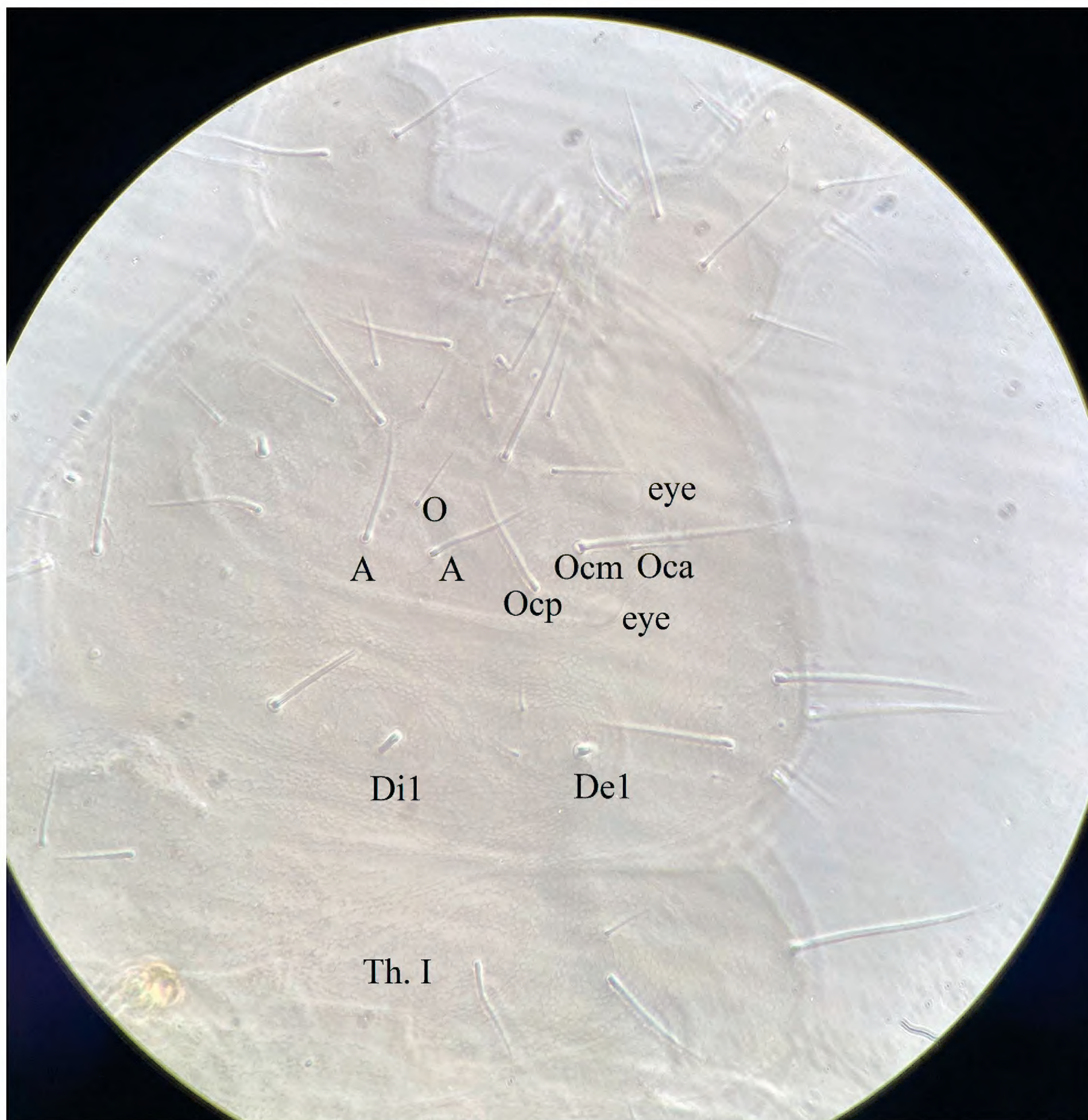


Figure 9. *Vitronura cheni* sp. nov.: tubercles and chaetotaxy on dorsal head.

Abdomen (Figs 13, 14 and Table 2). Abd. I–III with 4+4 tubercles each, Di with two, De with four (3+s), DI with two and L with 3 chaetae, respectively. Abd. IV with 4+4 tubercles, Di with two, De with three (2+s), DI with three and L with 6 chaetae, respectively. Abd. V dorsally with 2+2 tubercles, two Di separated, each with three chaetae, tubercle De with only one chaeta s, and fused to tubercle DI, DI with four chaetae. Abd. VI with 1+1 tubercles, and seven chaetae on each tubercle. VT with 4+4 chaetae (Fig. 14). Furcular remnant with 4 chaetae (Fig. 14).

Ecology. The new species was found on the trunk of pine trees.

Remarks on taxonomy. Morphologically, *Vitronura cheni* sp. nov. strongly resembles *V. tianmua* Jiang & Xia, 2018 from Zhejiang Province, China, in the presence of 3 chaetae on cephalic tubercle Oc, the presence of 3 chaetae on cephalic tubercle De, the presence of 4 teeth on the mandible, no inner tooth on

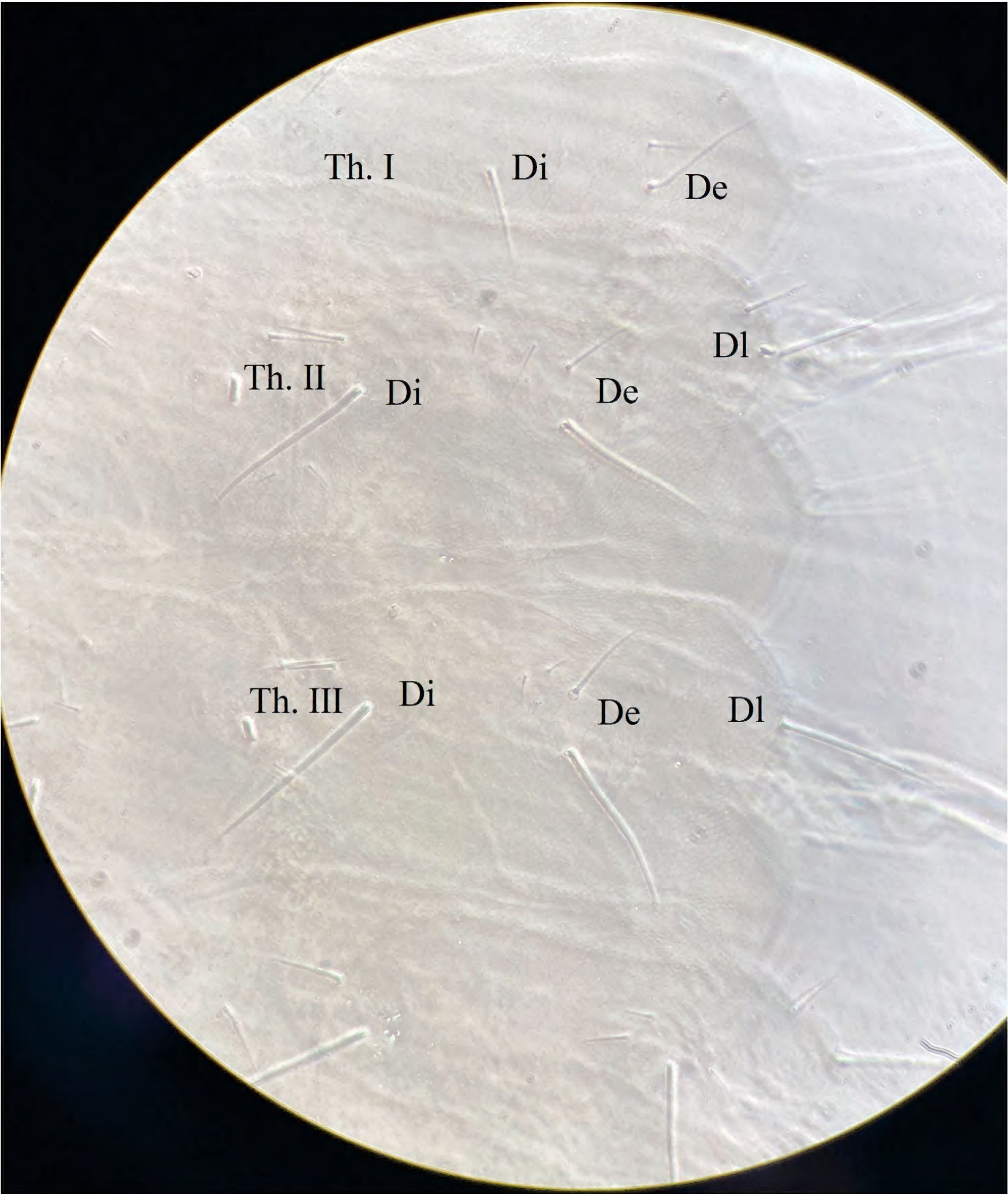
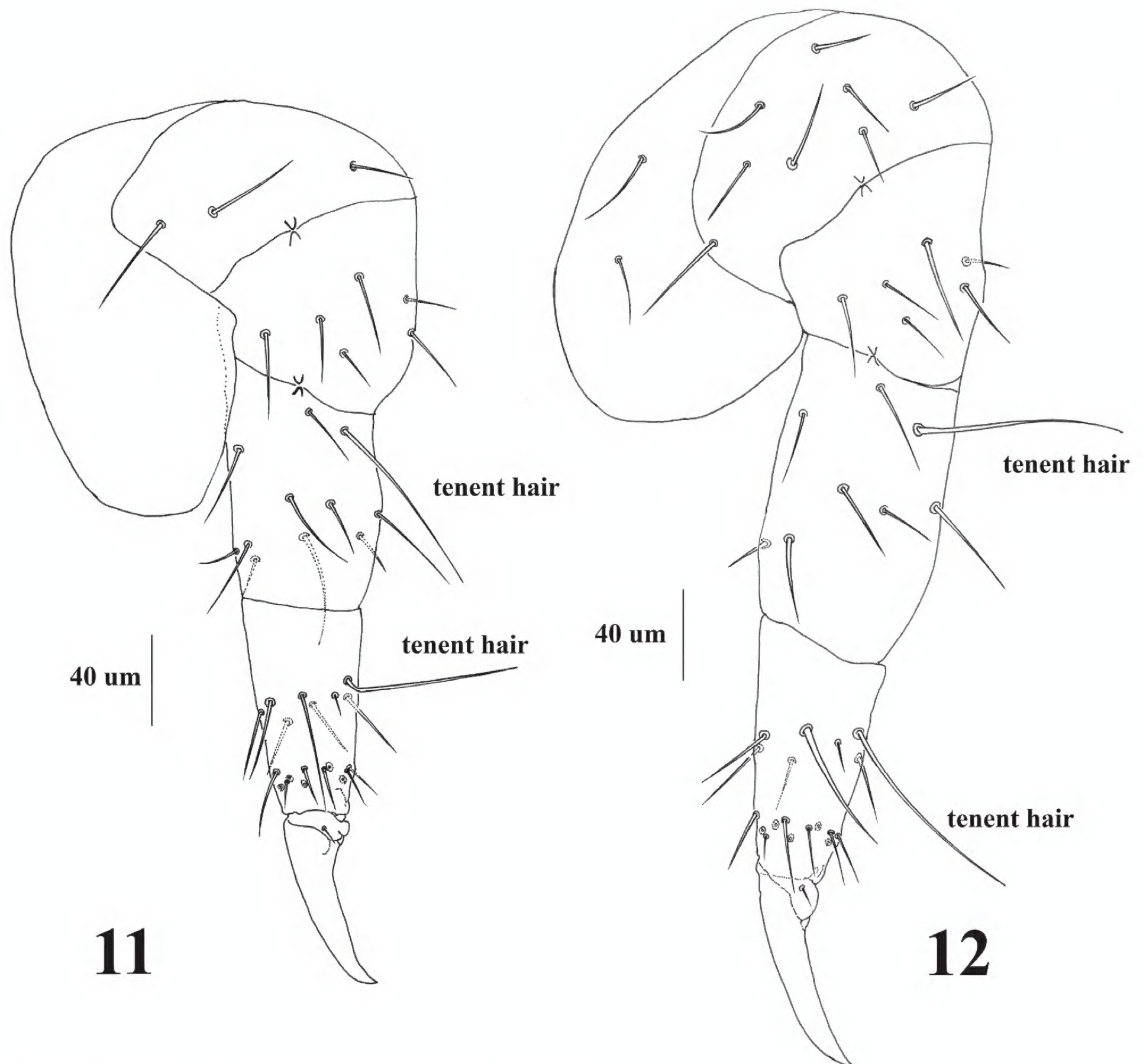


Figure 10. *Vitronura cheni* sp. nov.: tubercles and chaetotaxy on dorsal thorax.

the claw and no ogival labium. However, the new species can be distinguished from the latter by the following features: shape of body chaetae smooth and clavate in the new species versus blunt and serrate in the latter; the presence of chaeta O on cephalic tubercle Fr or not (chaeta O present in the new species versus chaeta O absent in the latter).

The new species is close to *V. macgillivrayi* (Denis, 1933) from Costa Rica in the following characters: 4 teeth on mandible, smooth body chaetae,



Figures 11, 12. *Vitronura cheni* sp. nov.: 11. Fore leg; 12. Hind leg.

tubercle Fr with chaeta O, 3 chaetae on tubercle Oc, and no inner tooth on claw. However, *Vitronura cheni* sp. nov. can be differentiated from *V. macgilivrayi* by the cephalic tubercle Di separate instead of the cephalic tubercle Di fused in the latter.

Vitronura cheni sp. nov. is similar to *Vitronura paraacuta* Wang, Wang & Jiang, 2016 from Hunan Province, China by sharing the following characters: 4 teeth on mandible, body macrochaetae smooth and clavate, tubercle Fr with 3 chaetae, tubercle Oc with 3 chaetae, tubercle De + DI with 5 (s+4) chaetae. However, *Vitronura cheni* sp. nov. can be separated from *Vitronura paraacuta* by having a truncate labrum, no inner tooth on the claw versus having an ogival labrum and an inner tooth on the claw in the latter. The following combination of characters of the new species can differentiate it from all known *Vitronura* species: big eyes on the head, an outstanding tenent chaeta on the tibiotarsus, 4 teeth on the mandible, and no inner tooth on the claw.

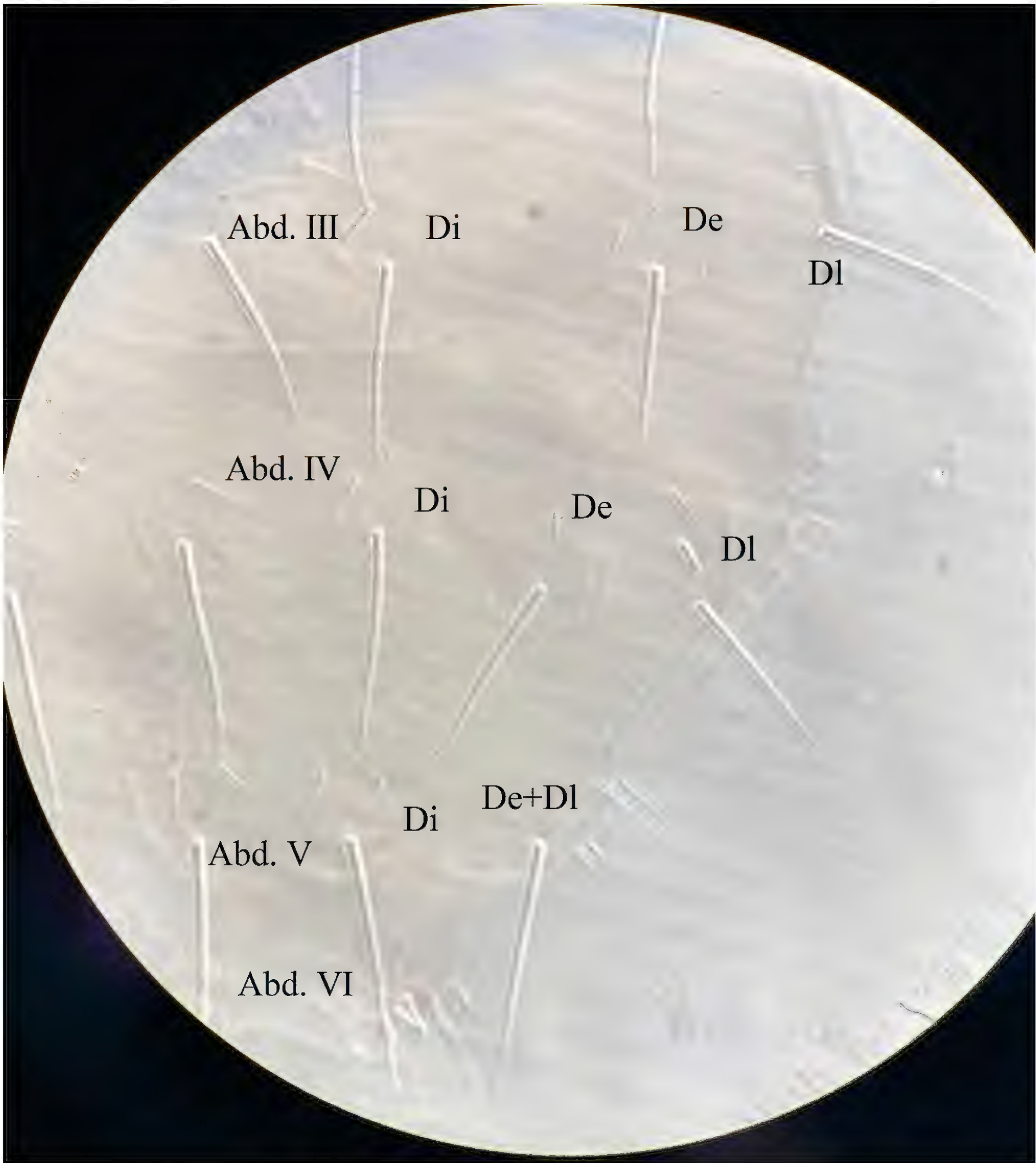


Figure 13. *Vitronura cheni* sp. nov.: tubercles and chaetotaxy on dorsal side of Abd. III –VI.

Remarks on ecology. Up to now, 25 valid species of the genus *Vitronura* Yosii, 1969 have been reported worldwide (Jiang et al. 2025), living in soil or under decayed leaves on the ground. By contrast, during our survey at 23 different locations in the ranges of Mt. Jiuyi, *Vitronura cheni* sp. nov. was collected exclusively from the trunks of pine trees, but was absent from all ground litter and soil samples, indicating that this species may have different environmental and resource preferences from other *Vitronura* species. Potential morphological adaptations for aboreal life include the large eyes and tenent chaetae on the femur and tibiotarsus, which may facilitate its locomotion between tree barks.

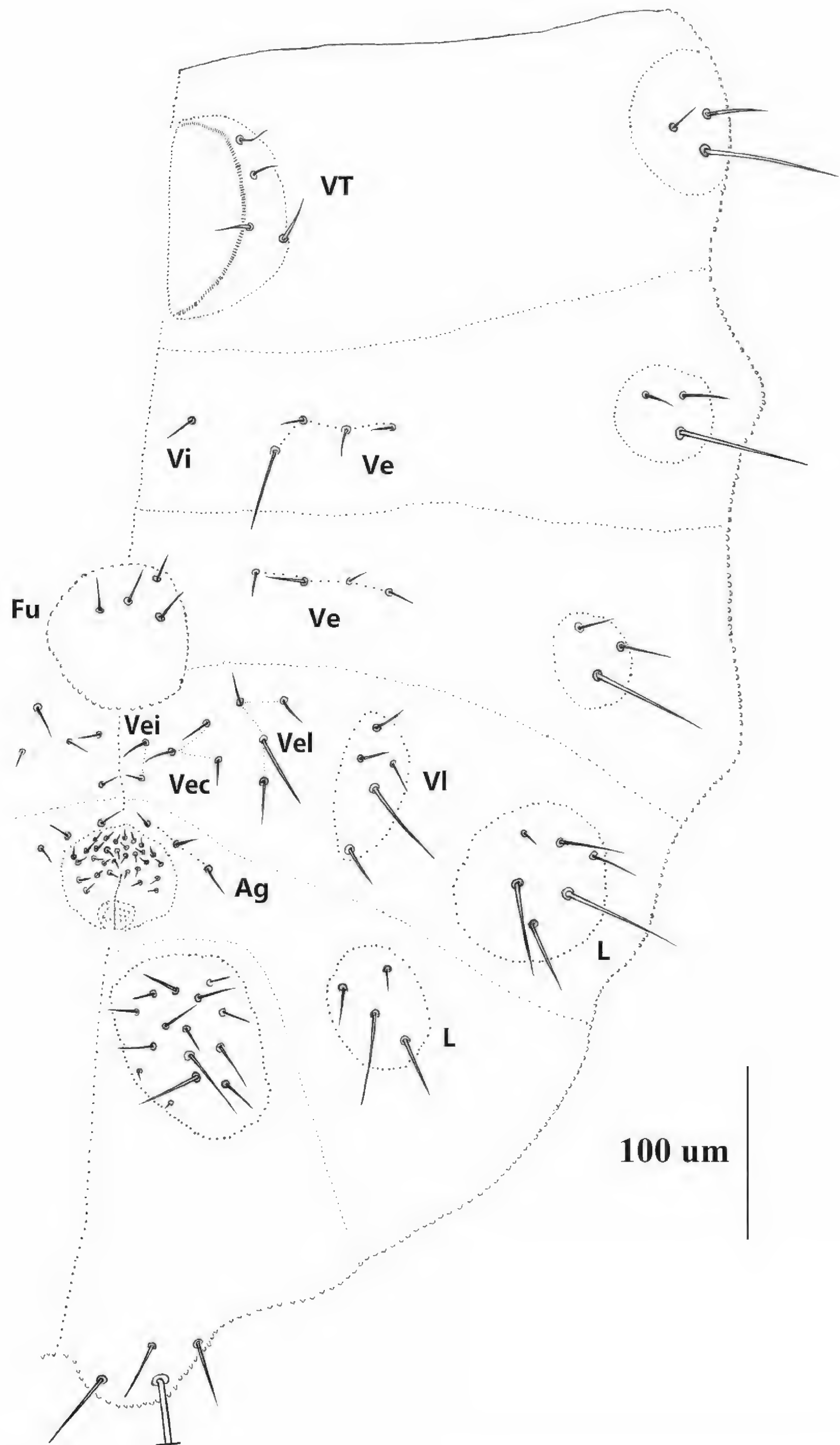


Figure 14. *Vitronura cheni* sp. nov.: ventral side of Abd. I–VI.

New record

Genus *Yuukianura* Yosii, 1955

Yuukianura szeptyckii Deharveng & Weiner, 1984

Figs 15–18, Tables 3, 4

Material. • One male and two females, Pipa Lake, Nanjing, Jiangsu Province, CHINA, coordinates: 32.0559°N, 118.8190°E, alt. ca 25 m, on bank of the lake, under a pile of aquatic grasses removed from the lake, leg. Daoyuan Yu.15. iv.2018. Materials are housed in the Key Laboratory of Zoology, Hunan University of Arts and Science (HUAS), Changde, Hunan Province, China.

Brief redescription. Body length 1.4–2.1 mm. Color. Reddish-orange while living (Fig. 15) and white in alcohol.

Chaetal morphology. Dorsal ordinary chaetae of four types. Long macrochaetae (Ml) pointed or blunt, and serrated. Short macrochaetae (Mc) shorter than Ml, almost smooth. Short macrochaetae (Mcc) morphologically similar to and shorter than Mc. Mesochaetae (me) on body smooth or serrated, pointed and various lengths. Chaetae-s on terga thin, smooth, usually shorter than Mc, and longer than Mcc.

Head. Eyes 3+3, uncolored, two eyes anterior to tubercle Oc, arrange one in front and one behind, the third one on posterior part of tubercle Oc (Fig. 16).

Buccal cone relatively short, labrum truncated, labral formula 0/2, 2.



Figure 15. Live specimens of *Yuukianura szeptyckii* feeding on yeast.

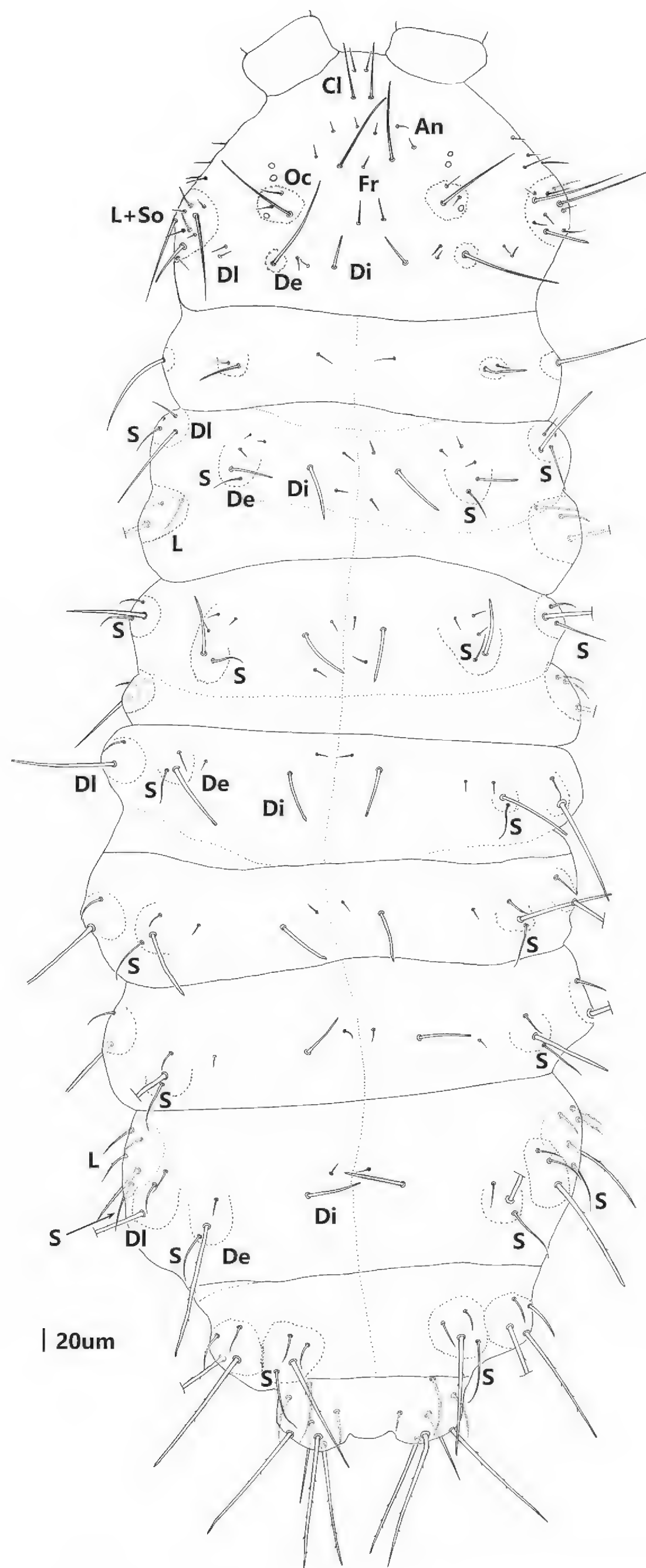


Figure 16. *Yuukianura szeptyckii*: body dorsal tubercles and chaetotaxy.

Cephalic dorsal tubercles and chaetotaxy as in Fig. 16 and Table 3. Tubercles Oc, De and L+So poorly developed, tubercle Oc with 3 chaetae; De with 3 chaetae, Di1 and De1 as mes not on the tubercle; DI with 2 chaetae; L and So fused to each other, with 2 Mls, 1 Mcc and 7 mes. Tubercle Fr with 3 chaetae, chaeta O far from chaeta A and close to An. Di with 1 Mcc. Cl, An, Fr and Di without tubercles.

Thorax (Fig. 16 and Table 4). Thoracic tubercle Di not differentiated. Di on Th. I with 1 chaeta, Di on Th. II–III with 3 chaetae respectively. Tubercle De on Th. I–III faint but distinct, with 2, 4+S, 4+S chaetae respectively. Tubercle DI of Th. I–III distinct, with 1, 2+S+ms, 2+S chaetae respectively. Tubercle L on Th. II–III feebly differentiated, with 3 chaetae each. Chaetotaxy of thorax and legs as in Table 1. Unguis with a basal inner tooth.

Abdomen (Figs 16–18 and Table 4). Tubercle Di not differentiated on Abd. I–IV, and each with 2 chaetae. De poorly differentiated on Abd. I–IV, and shift

Table 3. Cephalic tubercles and chaetotaxy of *Yuukianura szeptyckii*.

| Tubercle or group of chaetae | Tubercle | Number and type of chaetae | Names of chaetae |
|------------------------------|----------|----------------------------|------------------|
| Cl | - | 2 Mc | F |
| | | 2 me | G |
| Af | - | 2 MI | B |
| | | 2 Mcc | A |
| | | 7 me | C, D, E, O |
| Oc | + | 1 MI | Ocp |
| | | 2 me | Oca, Ocm |
| Di | - | 1 Mcc | Di1 Di2 |
| | | 1 me | |
| De | + | 1 MI | De1 |
| | | 1 me | De2 |
| DI | - | 2 me | Uncertain |
| L+So | + | 2 MI+1Mcc+8 me | Uncertain |

Note, -: without distinct tubercle; +: with distinct tubercle.

Table 4. Postcephalic dorsal tubercles and chaetotaxy of *Yuukianura szeptyckii*.

| Terga | | | | | Legs | | | | |
|----------|-------|-----|--------|-------|---------------------------------|----|----|----|----|
| | Di | De | DI | L | Scx2 | Cx | Tr | Fe | T |
| Th. I | 1 | 2 | 1 | – | 0 | 3 | 6 | 11 | 19 |
| Th. II | 3 | 4+s | 2+s+ms | 3 | 2 | 6 | 6 | 9 | 19 |
| Th. III | 3 | 4+s | 2+s | 3 | 2 | 8 | 6 | 9 | 18 |
| Terga | | | | | Sterna | | | | |
| Abd. I | 2 | 3+s | 2 | 3 | VT: 4 (5) | | | | |
| Abd. II | 2 | 3+s | 2 | 3 | Ve: 3–4, Vel: 0 | | | | |
| Abd. III | 2 | 3+s | 2 | 3 | Ve: 2–4, Fu: 4 | | | | |
| Abd. IV | 2 | 2+s | 3 | 4–5+s | Vei: 1, Vec: 2, Vel: 4–5, VI: 5 | | | | |
| Abd. V | 3+S+4 | | | 5 | Ag: 3, VI: 1, L': 0 | | | | |
| Abd. VI | 7 | | | | Ve: 15–16, An: 3 mi | | | | |

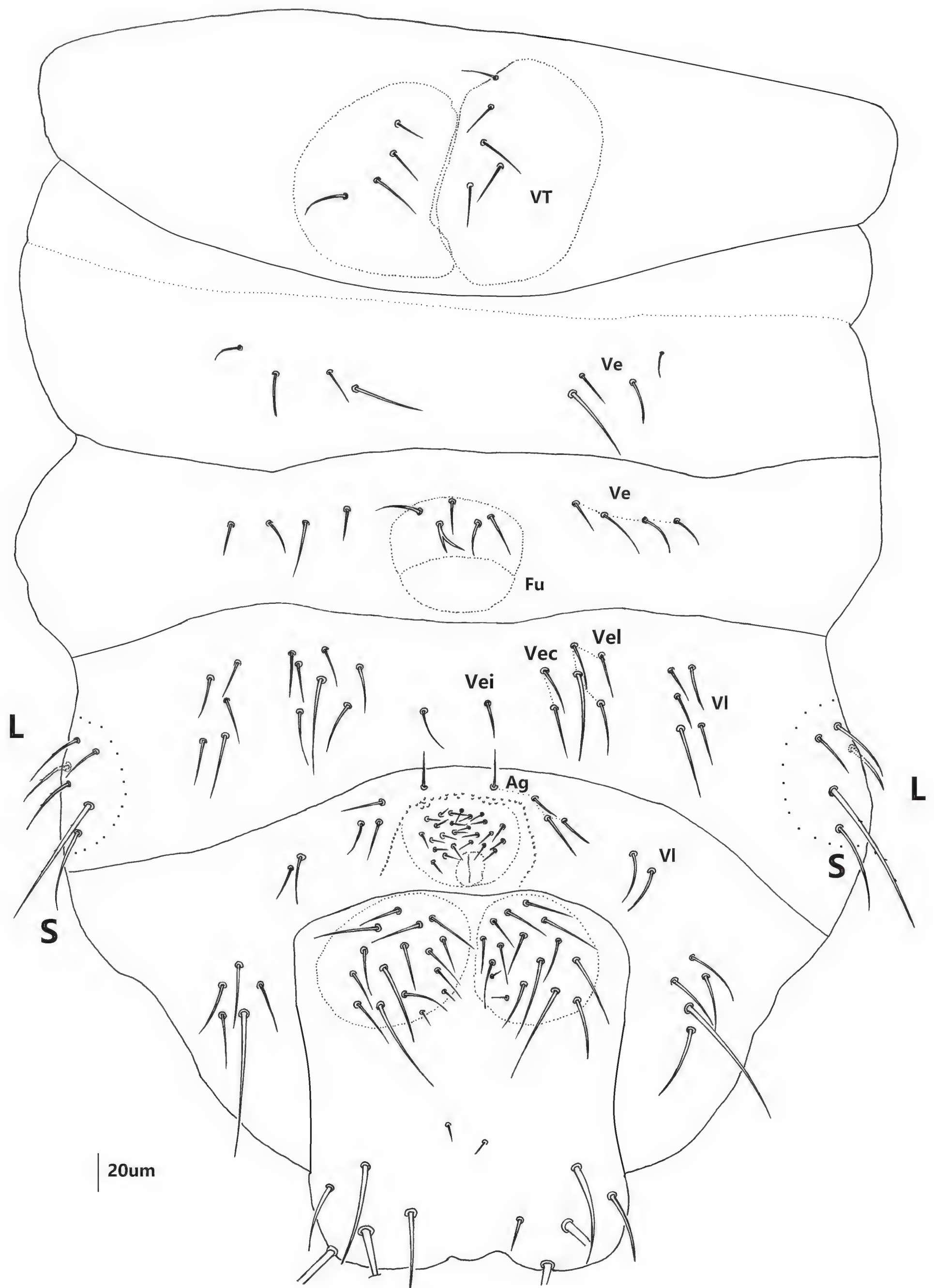


Figure 17. *Yuukianura szeptyckii*: ventral side of Abd. I–VI.

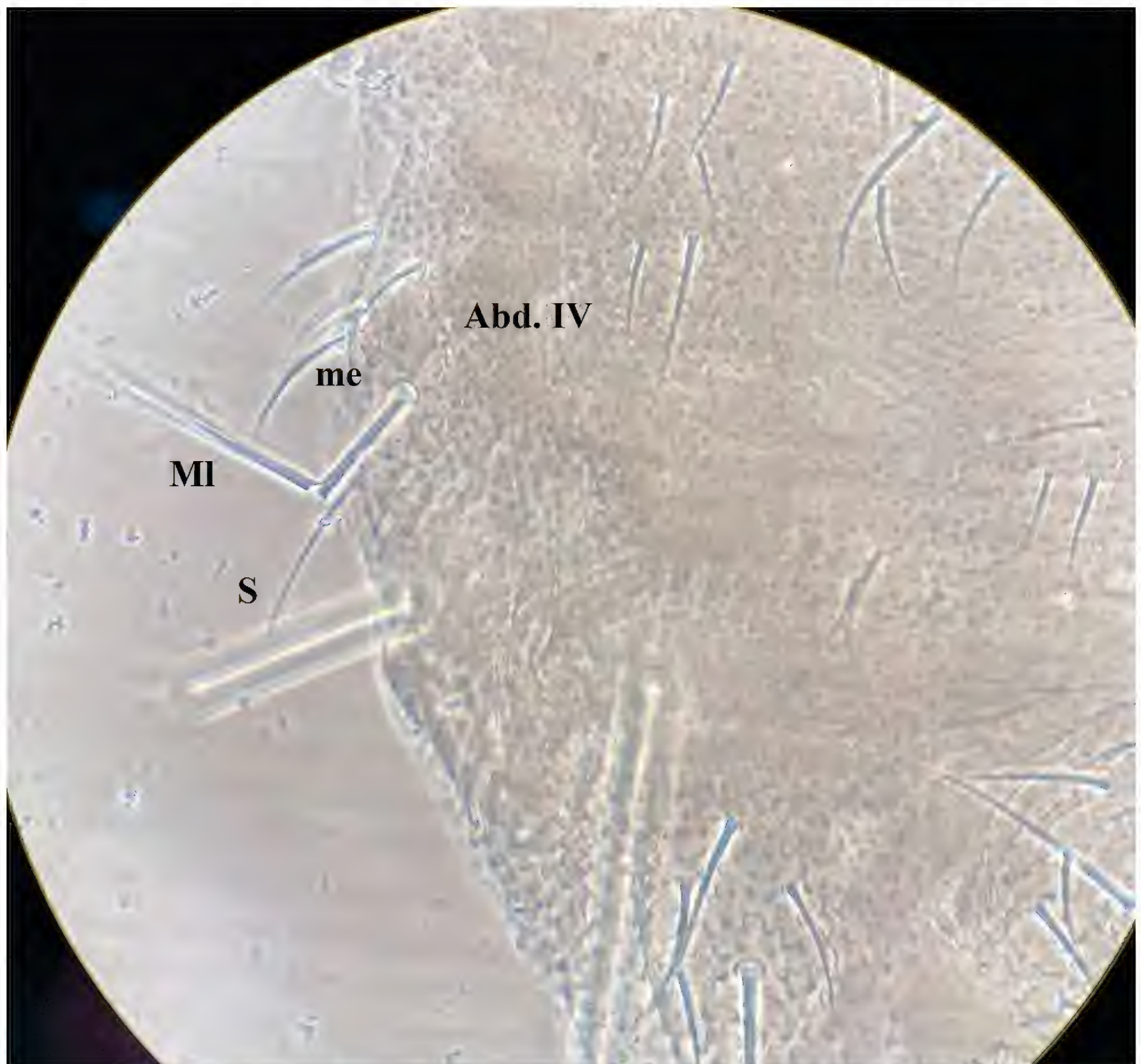


Figure 18. *Yuukianura szeptyckii*: chaeta s on tubercle L of Abd. IV.

laterally. De with 4 (3+s) chaetae on Abd. I–III respectively. Tubercle De on Abd. IV with 3 (2+s) chaetae. Tubercle DI with 2 chaetae and L with 3 chaetae on Abd. I–III, both DI and L poorly differentiated. Tubercle DI on Abd. IV with 3 chaetae. Tubercle L on ventral Abd. IV always with 1 chaeta s, 1 MI and 3–4 mes (Figs 16–18). Abd. V dorsally with 2+2 tubercles, tubercles Di and De completely fused, with 4(3+s) chaetae, tubercle DI with 4 chaetae. However, tubercle Di+De partly fused to tubercle DI. Abd. VI with one tubercle on each side, each with 7 chaetae. VT with 4 (sometimes 5) chaetae (Fig. 17). Furcular remnant with 5 chaetae (Fig. 17).

Ecology. This species was found in humid litter of aquatic grasses piled on the shore of the lake.

Remarks. *Yuukianura szeptyckii* was first reported from North Korea, and later from Japan (Tanaka and Hasegawa 2010). Now it is for the first time reported from China, suggesting this species is probably widely distributed in East Asia.

So far, including the new species, a total of 11 *Yuukianura* species have been reported worldwide. Of these, five species—*Y. aphoruroides* (Yosii, 1953), *Y. deharvengi* Smolis, 2017, *Y. halophila* Yosii, 1955, *Y. rosea* (Kim & Lee, 2000), and *Y. szeptyckii*—have 3+3 eyes on the head. Among these five species, only *Y. deharvengi* has pigmented eyes. The remaining six species—*Y. hawaiiensis* (Bellinger & Christiansen, 1974), *Y. judithae* Deharveng, Palacios-Vargas & Bedos, 2017, *Y. kikaiensis* Kasai, 2024, *Y. pacifica* (Yosii, 1971), *Y. tongana* Yosii, 1964 and *Y. yasudai* (Yosii, 1966)—lack eyes entirely.

Checklist of *Yuukianura* species and distributions

Y. aphoruroides (Yosii, 1953) Great Britain, China, Japan, Malaysia.
Y. deharvengi Smolis, 2017, Vietnam.
Y. halophila Yosii, 1955, Japan
Y. hawaiiensis (Bellinger & Christiansen, 1974), USA (Hawaii).
Y. judithae Deharveng, Palacios-Vargas & Bedos, 2017, Vanuatu.
Y. kikaiensis Kasai, 2024, Japan.
Y. pacifica (Yosii, 1971), Japan.
Y. rosea (Kim & Lee, 2000), South Korea.
Y. szeptyckii Deharveng & Weiner, 1984, North Korea, Japan, China (new record).
Y. tongana Yosii, 1964, The Kingdom of Tonga (Tonga islands).
Y. yasudai (Yosii, 1966), Nepal.

Observation of the feeding behavior of *Yuukianura szeptyckii* in culture

Yuukianura szeptyckii showed equal feeding preferences for yeast and oats (Fig. 15), but did not feed on the slime mold. Under the feeding conditions of the first two food sources, *Y. szeptyckii* can successfully molt, lay eggs and hatch, thus completing its full life cycle (unpublished data). This feeding preference differs from that of other reported neanurids consuming slime molds (Fig. 19, also see Hoskins et al. 2015).

We also compared the feeding action of *Y. szeptyckii* with that of *Crossodonthina* sp. and *Orthonychiurus* sp. (Suppl. material 1). While it is feeding, *Y. szeptyckii* presses its buccal cone against the food surface and sticks out its maxillae to grasp food particles and brings them into its mouth, while its head keeps moving to find a suitable feeding spot (Suppl. material 1: Video Part A). This feeding action is similar to that of *Orthonychiurus* sp. (Suppl. material 1: Video Part B) and other families of Collembola, but differs from that of *Crossodonthina* sp. of the same family (same subfamily and tribe). *Crossodonthina* sp. (which feeds only on slime molds among the three food resources provided) inserts the tip of its buccal cone into the plasmodia and veins of the slime mold to suck out protoplasm, while keeping its head and body still, which is similar to the feeding action reported in other species of Neanuridae (Hoskins et al. 2015). Mouthpart movements are detectable only by subtle head tremors (Suppl. material 1: Video Part C).

In summary, the feeding preference and action of *Y. szeptyckii* differ significantly from *Crossodonthina* sp., while resembling those of non-neanurid Collembola, such as *Orthonychiurus*. This suggests that this group (*Yuukianura*) may occupy a unique position within the family Neanuridae. Intriguingly, both groups we have observed, namely *Yuukianura* and *Crossodonthina*, have more



Figure 19. *Crossodonthina* sp. feeding on slime mold.

complicated mouthparts among Neanurinae, but only the former showed different feeding behavior from others (sensu Hoskins et al. 2015), suggesting a potential mismatch between morphology and function. Future research should focus on observing the feeding behavior of other *Yuukianura* species and other genera of Neanuridae, in combination with molecular analyses, to determine the phylogenetic position of this genus, evaluate the relatedness of feeding behavior to phylogeny, and reveal the exact correlation between the morphologies of mouthparts and their functions.

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Additional information

Conflict of interest

The authors have declared that no competing interests exist.

Ethical statement

No ethical statement was reported.

Use of AI

No use of AI was reported.

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Author contributions

Conceptualization: DY, JGJ. Data curation: JGJ. Formal analysis: JGJ. Funding acquisition: DY. Investigation: JGJ, DY. Methodology: JGJ. Project administration: DY. Resources: JGJ, DY. Supervision: DY. Validation: DY. Visualization: DY, JGJ. Writing – original draft: DY, JGJ. Writing – review and editing: DY.

Author ORCIDs

Ji-Gang Jiang  <https://orcid.org/0000-0002-4484-3312>

Daoyuan Yu  <https://orcid.org/0000-0003-2984-0540>

Data availability

All of the data that support the findings of this study are available in the main text or Supplementary Information.

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Supplementary material 1

Supplementary videos

Authors: Ji-Gang Jiang, Daoyuan Yu

Data type: mp4

Explanation note: Supplementary videos on YouTube (https://youtu.be/_SVKQAGRTvw):
A *Yuukianura* feeding on yeast **B** *Orthonychiurus* feeding on yeast **C** *Crossodonthina* feeding on slime mold.

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